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IS 5478 (1969): Thermostat metal sheet and strip [MTD 4: Wrought Steel Products]



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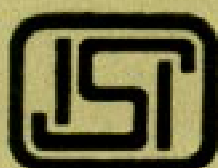
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IS : 5478 - 1969

Indian Standard
SPECIFICATION FOR
THERMOSTAT METAL SHEET AND STRIP

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Indian Standard

SPECIFICATION FOR THERMOSTAT METAL SHEET AND STRIP

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MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

Indian Standard

SPECIFICATION FOR THERMOSTAT METAL SHEET AND STRIP

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 1 December 1969, after the draft finalized by the Metal Standards Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 In the preparation of this standard assistance has been derived from ASTM Designation B 388-68 'Specification for thermostat metal sheet and strip' issued by the American Society for Testing and Materials.

0.3 This standard may also be used as a guide in preparing detailed specifications for various specified types of thermostat metals by the inclusion of respective material constants, such as chemical composition and physical properties.

0.4 This standard contains an informative appendix (Appendix A) giving the information to be furnished by the purchaser while ordering for the material.

0.5 This standard contains clauses **3.1.1, 5.1 to 5.3, 7.3, 7.3.1, 7.3.2, 7.5, 8.1, 9.1 and 11.1** which call for an agreement between the purchaser and manufacturer.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS:2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the general requirements for thermostat metal in the form of sheet and strip.

*Rules for rounding off numerical values (*revised*).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Camber — The deviation of a side edge from a straight line measured as a chord height and varies approximately with the square of the stock length.

2.2 Cross Curvature — The deviation from flat across the width and is measured as a chord height.

2.3 Thermostat Metal* — A composite material, usually in the form of sheet or strip, comprising two or more materials of any appropriate nature, metallic or otherwise, which, by virtue of the differing coefficients of linear expansion of the components which tends to alter its curvature when its temperature is changed.

3. CERTIFICATE OF COMPLIANCE

3.1 The supplier shall furnish a certificate that the material supplied complies with the requirements of the material specification.

3.1.1 Marking — One side of the thermostat metal shall be marked over the entire length and width in accordance with the supplier's own standards. This marking shall be made preferably with a durable and legible etching stain and preferably on the low expansive side. Special markings desired by the purchaser shall be agreed to between the purchaser and the supplier.

3.2 The supplier's certification shall be implied, if the material is certified under the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

4. CHEMICAL COMPOSITION

4.1 The chemical composition of the component materials used for a particular type of thermostat metal shall conform to those specifications established by the supplier to obtain certain physical properties of the thermostat metal.

*Also known as thermobimetal, thermometal, thermostatic bimetal thermal bimetal, etc.

5. PHYSICAL PROPERTIES

5.1 Flexivity — The flexivity of a particular type of thermostat metal shall conform to those specifications established by the supplier and shall be as agreed to between the purchaser and the supplier. The flexivity shall be determined in accordance with IS: 2855 - 1964*.

5.2 Hardness — The hardness of the components of a particular type of thermostat metal shall conform to those specifications established by the supplier and shall be as agreed to between the purchaser and the supplier. In the case of three or more components, usually the hardness of the outer components only is determined. The hardness shall be determined in accordance with IS: 2866 - 1965†.

5.3 Electrical Resistivity — The electrical resistivity of a particular type of thermostat metal shall conform to those specifications established by the supplier and shall be as agreed to between the purchaser and the supplier. The electrical resistivity shall be specified in terms of ohm.mm²/m or micro-ohm/cm. The electrical resistivity shall be determined in accordance with IS: 3635 - 1966‡.

6. TEMPERATURE RANGES

6.1 Linear Deflection Range — Suppliers of thermostat metal shall specify for each type of thermostat metal a temperature range of linear deflection (in degree centigrade) within which the flexivity of thermostat metal (or any other measure of thermal sensitivity) remains within 10 percent of the maximum value.

6.2 Useful Deflection Range — Suppliers of thermostat metal shall specify for each type of thermostat metal a temperature range of useful deflection (in degree centigrade) such that (a) flexivity (or any other measure of thermal sensitivity of the thermostat metal) is at least one fourth of the maximum value at any temperature within that range; and (b) the stresses set up do not produce any permanent deformation when the thermostat metal is freely heated to any temperature within that range.

6.3 Maximum Temperature — Suppliers of thermostat metal shall specify for each type of thermostat metal a maximum temperature up to which the thermostat metal may be heated (without any restraint) such that the thermostat element does not undergo any permanent deformation; or that the sensitivity of the thermostat metal is not too low to be of any use.

*Method of test for determining flexivity of thermostat metals.

†Method of Vickers hardness test for copper and copper alloys.

‡Methods of test for resistance of metallic electrical resistance material.

7. DIMENSIONS AND TOLERANCES

7.1 Thickness—The thickness shall be that specified in the purchase order or drawing and the tolerances shall be as specified in Table 1.

TABLE 1 PERMISSIBLE VARIATIONS IN THICKNESS OF SHEET OR STRIP

THICKNESS	TOLERANCE
(1)	(2)
mm	mm
Under 0.1	± 0.008
0.10 to 0.199 (including)	± 0.009
0.20 „ 0.299 (including)	± 0.010
0.30 „ 0.399 (including)	± 0.011
0.40 „ 0.499 (including)	± 0.012
0.50 and over	$\pm 2.5 \%$

7.2 Width—The width shall be that specified in the purchase order or drawing and the tolerances shall be as specified in Table 2.

TABLE 2 PERMISSIBLE VARIATIONS IN WIDTH OF SHEET OR STRIP

WIDTH	TOLERANCE
(1)	(2)
mm	mm
25 including	± 0.10
Over 25 up to and including 75	± 0.20
Over 75	± 0.25

7.3 The thermostat metal shall be furnished in the form of flat lengths or coils, as specified in the purchase order or drawing. As agreed to between the purchaser and the supplier, a specified maximum percentage by weight may be supplied in shorter lengths than that specified. The tolerances for flat lengths shall be as specified in Table 3.

TABLE 3 PERMISSIBLE VARIATIONS IN FLAT LENGTHS OF SHEET OR STRIP

LENGTH	TOLERANCE
(1)	(2)
mm	mm
Up to 0.5	± 1
Over 0.5 up to and including 1	± 2
Over 1 up to and including 3	± 10
	— 2

7.3.1 Coils — Material furnished in the form of coils shall be supplied as agreed to between the purchaser and the supplier. The inner diameter and the outer diameter or the inner diameter and the maximum weight of the coils may be specified. As agreed to between the purchaser and the supplier, a specified maximum percentage by weight may be supplied with a smaller outer diameter than that specified.

7.3.2 Welds — Any welds used to provide single continuous lengths necessary to meet coil size or weight specifications shall be clearly identified as established by the supplier or as agreed to between the purchaser and the supplier. The welds shall be to the material dimensions or smaller. A minimum length between welds may be specified with a maximum number of shorter lengths as agreed to between the purchaser and the supplier.

7.3.3 Lengthwise Flatness — The material, if furnished in flat lengths, shall be supplied with a maximum deviation (expressed as chord height) from flat at $27^{\circ} \pm 1^{\circ}\text{C}$ determined in accordance with the following formula:

$$\text{Chord height} + \frac{0.6}{t} \text{ mm}$$

where t is the thickness of material in millimetres.

NOTE — This formula applies to a chord length of 10 cm.

7.4 Camber — The camber shall not exceed 10 mm in a metre length.

7.5 Cross Curvature — The cross curvature tolerances shall be held to an absolute minimum for any particular type, size and hardness of material as measured at $27^{\circ} \pm 1^{\circ}\text{C}$ and shall be as agreed to between the purchaser and the supplier.

8. BOND

8.1 The bond between the component materials shall be strong and complete over the entire area of sheet or strip. Tests for the assessment of the quality of the bond shall be as agreed to between the purchaser and the supplier.

9. REVERSE BEND TEST

9.1 Reverse bend test is recommended for a quick assessment of the quality of the bond and the ductility of the thermostat metal sheet or strip. The width of the specimen shall be about 10 times the thickness; the thickness shall be preferably between 0.7 to 1.0 mm. The length of the specimen

shall depend on the apparatus used for bend test. The specimen shall be subjected to reverse bending through 180° over a radius two to three times the thickness of the strip, till the specimen breaks. The specimen should be under tension sufficient to prevent wrinkling during reverse bending. The number of reverse bend before failure shall be agreed to between the purchaser and the supplier. The bifurcation of the constituent layer at the fracture region is an indication of poor bonding. The fractured strip shall not show any visible bifurcation on fracture by reverse bend test. The specimen is to be tested both in annealed and 50 percent cold-rolled condition.

10. WORKMANSHIP AND FINISH

10.1 The surface of the material shall be free from cracks, seams, laps, scratches, blisters, rust or other defects detrimental to the performance of the material or to the manufacture of parts therefrom. Surfaces of strip at welds for continuous coils shall be reasonably free from the above defects but not to the extent specified on the balance of the material surface.

10.2 The edges of the thermostat metal shall be as-slit without excessive burrs or distortions.

11. MATERIAL SEGREGATION

11.1 The thermostat metal shall be supplied segregated into two groups after slitting, (a) the burr being on the low expansive component, or (b) the burr on the high expansive component, whichever is applicable. These two groups shall be identified separately and boxed separately or together as agreed to between the purchaser and the supplier.

12. PACKING

12.1 The thermostat metal shall be packaged in such a manner as to prevent damage in ordinary handling and transportation. Each individual size and type of material shall be boxed separately. Each batch of material shall be plainly marked with the following:

- a) Purchase order number,
- b) Net weight of material,
- c) Supplier's type of material,
- d) Supplier's name, and
- e) Purchaser specification number.

APPENDIX A

(Clause 0.4)

INFORMATION TO BE SUPPLIED BY PURCHASER

A-1. The purchaser shall state in his enquiry or order:

- a) Type designation,
 - b) Thickness,
 - c) Width,
 - d) Length (cut length or coils), and
 - e) Weight (total for each size).
-

(Continued from page 1)

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